

B7. Terminal and Splice Investment per line

Definition

The installed cost per line for the terminal and splice that connect the drop to the distribution cable.

Default Value

Terminal and Splice Investment per Line	
Buried	Aerial
\$42.50	\$32.00

B8. Drop Cable Investment, per foot and Pairs per Wire

Definition

The investment per foot required for aerial and buried drop wire, and the number of pairs in each type of drop wire.

Default Values

Drop Cable Investment, per foot		
	Material Cost Per foot	Pairs
Buried	\$0.140	3
Aerial	\$0.095	2

CABLE AND RISER INVESTMENT

B9. Distribution Cable Sizes

Definition

Cable sizes used for distribution cable variables (in pairs).

Default Values

Cable Sizes
2400
1800
1200
900
600
400
200
100
50
25
12
6

B10. Copper Distribution Cable, \$/foot

Definition

The cost per foot of copper distribution cable, as a function of cable size, including the costs of engineering, installation, and delivery, as well as the cable material itself.

Default Values

Copper Distribution Cable, \$/foot	
Cable Size	Cost/foot (including engineering, installation, delivery and material)
2400	\$20.00
1800	\$16.00
1200	\$12.00
900	\$10.00
600	\$7.75
400	\$6.00
200	\$4.25
100	\$2.50
50	\$1.63
25	\$1.19
12	\$0.76
6	\$0.63

B11. Riser Cable, \$/foot

Definition

The cost per foot of copper riser cable (cable inside high-rise buildings), as a function of cable size, including the costs of engineering, installation, and delivery, as well as the cable material itself.

Default Values

Biser Cable, \$/foot	
Cable Size	Cost/foot (including engineering, installation, delivery and material)
2400	\$25.00
1800	\$20.00
1200	\$15.00
900	\$12.50
600	\$10.00
400	\$7.50
200	\$5.30
100	\$3.15
50	\$2.05
25	\$1.50
12	\$0.95
6	\$0.80

POLES AND CONDUIT

B12. Pole Investment

Definition

The installed cost of a 40-foot Class 4 treated southern pine utility pole

Default Value

Pole Investment	
Materials	\$201
Labor	\$216
Total	\$417

B13. Buried Copper Cable Sheath Multiplier (feeder and distribution)

Definition

The additional cost of the filling compound used in buried cable to protect the cable from moisture expressed as a multiplier of the cost of non-filled cable.

Default value

1.04

B14. Conduit Material Investment per foot

Definition

Material cost per foot for 4" PVC.

Default Value

\$0.60

B15. Spare Tubes per Route (distribution)

Definition

The number of spare tubes (i.e., conduit) placed per route.

Default Value

1

B16. Regional Labor Adjustment Factor (moved to the end of this document)

Note: This parameter is moved to the end of the document, page 77.

PLACEMENT FRACTION

B17. Distribution Structure Fractions

Definition

The distribution cable structure fractions are the relative amounts of different structure types supporting distribution cable in each density zone. Aerial distribution cable is attached to telephone poles or buildings, buried cable is laid directly in the earth, and underground cable runs through underground conduit. In the highest two density zones, aerial structure includes riser and block cable.

The buried fraction available for shift parameter is defined as the fraction of buried cable input value that is available to be shifted to aerial or the fraction of the input value by which the amount of buried cable can increase. If, for example, the user has entered an initial value of 0.5 for the buried cable fraction in a given density zone and then enters 0.6 as the buried fraction available for shift, the model can allow the computed buried fraction (according to local surface and bedrock conditions) to vary up or down by 0.3 (60% of 0.5), and thus lie between 0.2 and 0.8. Separate values must be entered for each density range, and the computed fraction of buried cable is not allowed by the model to exceed 1.0. Note that the parameter and associated process are applied to both distribution and feeder cable.

Defaults

Distribution Cable Structure Fractions				
Density Zone	Aerial/Block Cable	Buried Cable	Underground Cable (calculated)	Buried Fraction Available for Shift
0-5	.25	.75	0	.75
5-100	.25	.75	0	.75
100-200	.25	.75	0	.75
200-650	.30	.70	0	.75
650-850	.30	.70	0	.75
850-2,550	.30	.70	0	.75
2,550-5,000	.30	.65	.05	.75
5,000-10,000	.60	.35	.05	0
10,000+	.85	.05	.10	0

CABLE SIZING FACTORS AND POLE SPACING

B18. Distribution Cable Sizing Factors

Definition

The factor by which distribution cable is increased above the size needed to serve a given quantity of demand in order to provide spare pairs for breakage, line administration, and some amount of growth. HM 5.0a divides the number of pairs needed in a distribution cable to meet existing demand by this factor to determine the minimum number of pairs required, then uses the next larger available size cable.

Default Values

Distribution Cable Sizing Factors	
Density Zone	Factors
0-5	.50
5-100	.55
100-200	.55
200-650	.60
650-850	.65
850-2,550	.70
2,550-5,000	.75
5,000-10,000	.75
10,000+	.75

B19. Distribution Pole Spacing

Definition

Spacing between poles supporting aerial distribution cable. HM 5.0a assumes Aerial Cable in the two densest zones is Block and Building Cable, not support on poles.

Default Values

Distribution Pole Spacing	
Density Zone	Spacing
0-5	250
5-100	250
100-200	200
200-650	200
650-850	175
850-2,550	175
2,550-5,000	150
5,000-10,000	N/A
10,000+	N/A

GEOLOGY AND CLUSTERS

B20. Distribution Multiplier, Difficult Terrain

Definition

The amount of extra distance required to route distribution and feeder cable around difficult soil conditions, expressed as a multiplier of the distance calculated for normal situations.

Default

1.0

B21. Rock Depth Threshold, inches

Definition

The depth of bedrock, above which (that is, closer to the surface) additional costs are incurred for placing distribution or feeder cable.

Default

24 inches

B22. Hard Rock Placement Multiplier

Definition

The increased cost required to place distribution or feeder cable in bedrock classified as hard, when it is within the rock depth threshold of the surface, expressed as a multiplier of normal installation cost per foot.

Default

3.5

B23. Soft Rock Placement Multiplier

Definition

The increased cost required to place distribution or feeder cable in bedrock classified as soft, when it is within the rock depth threshold of the surface, expressed as a multiplier of normal installation cost per foot.

Default

2.0

B24. Sidewalk / Street Fraction

Definition

The fraction of small, urban clusters that are streets and sidewalks, used in the comparison of cluster area with number of lines to identify cases where high rise buildings are present. To qualify as a small urban cluster, the total land area must be less than .03 square miles and the line density must exceed 30,000 lines per square mile.

Default

0.20

B25. Maximum Analog Copper Total Distance

Definition

The maximum total copper cable length that is allowed to carry voiceband analog signals. When the potential copper cable length exceeds this threshold, it triggers long loop treatment and/or the deeper penetration of fiber based DLC.

Default

18,000 ft.

B26. Feeder steering enable

Definition

An option that, if enabled, instructs the model to adjust each main feeder route direction toward the preponderance of clusters in a quadrant. In the default state, feeder route directions from the wire center are North, East, South, and West.

Default

The default setting is disabled.

B27. Main feeder route/air multiplier

Definition

Route-to-air multiplier applied to main feeder distance when feeder steering is enabled to account for routing main feeder cable around obstacles.

Default

1.27

B27a. Require serving areas to be square

Definition

An option that, if enabled, instructs the model to treat all main clusters as square. In the default state, main clusters are computed as rectangular, with the height to width ratio determined by the process that produces the cluster input data.

Default

The default setting is disabled.

LONG LOOP INVESTMENTS

B28. T1 Repeater Investment, Installed

Definition

The investment per T1 repeater, including electronics, housing, and installation, used for T1 carrier long loop extensions.

Default

\$527.00

B29. CO Mux Capacity, installed

Definition

The installed central office multiplexer investment required per road cable used for T1 carrier long loop extensions.

Default

\$420.00

B30. Remote Terminal Cabinet and Common Equipment, Installed

Definition

The installed investment per T1 RT used for T1 carrier long loop extensions.

Default

\$8,200.00

B31. T1 Channel Unit Investment per Subscriber

Definition

The investment per line in POTS channel units installed in T1 RT used for T1 carrier long loop extensions.

Default

\$125.00

B32. Transceiver Investment per RT, Installed

Definition

The installed investment for the transceiver plug-in per T1 RT used to interface with the T1 carrier and to power the repeaters.

Default

\$1,170.00

B33. T1 Remote terminal fill factor

Definition

The line unit fill factor in a T1 remote terminal; that is, the ratio of lines served by a T1 remote terminal to the number of line units equipped in the remote terminal.

Default

0.90

B34. Maximum T1s per cable

Definition

Maximum number of T1s that can share a cable without binder group separation or internal shielding.

Default

8

B35. T1 repeater spacing

Definition

Minimum design separation, measured in decibels, on copper cable as a function of the maximum loss

between adjacent repeaters at 772 kHz, and the loss of the copper cable on which the repeaters are installed. Used for T1 carrier long loop extensions.

Default

32.0 dB

B36. Aerial T1 Attenuation

Definition

The copper cable attenuation for the design of T1 circuits at an operational frequency of 772 kHz and a maximum temperature of 140 degrees Fahrenheit. Based on air core PIC (Plastic Insulated Conductor) cable.

Default

6.3 dB/kft.

B37. Buried T1 Attenuation

Definition

The copper cable attenuation for the design of T1 circuits at an operational frequency of 772 kHz and at normal operating temperature. Based on water blocking compound filled cables, using solid PIC insulation.

Default

5.0 dB/kft.

SERVING AREA INTERFACE INVESTMENT

B38. Serving Area Interface (SAI) Investment

Definition

The installed investment in the SAI that acts as the physical interface point between distribution and feeder cable.

Default Values

SAI Investment		
SAI Size	Indoor SAI	Outdoor SAI
7200	\$9,656	\$10,000
5400	\$7,392	\$8,200
3600	\$4,928	\$6,000
2400	\$3,352	\$4,300
1800	\$2,464	\$3,400
1200	\$1,776	\$2,400
900	\$1,232	\$1,900
600	\$888	\$1,400
400	\$592	\$1,000
200	\$296	\$600
100	\$148	\$350
50	\$98	\$250

DEDICATED CIRCUIT INPUTS

B39. Percentage of Dedicated Circuits

Definition

The fractions of total circuits included in the count of total private line and special access circuits that are DS-0 and DS-1 circuits, respectively. The fraction of DS-3 and higher capacity circuits is calculated by the model as $(1 - \text{fraction DS-0} - \text{fraction DS-1})$. The equivalence between the three circuit types -- that is, DS-0, DS-1, and DS-3 -- and wire pairs is expressed by Parameter B36. Note that the model assumes the circuit counts are expressed in terms of the number of DS-0, DS-1, and DS-3, circuits, respectively, not voice grade circuits or DS-0 equivalents. Thus if the data source expresses all circuit counts as DS-0 equivalents, as is the case with the existing ARMIS 43-08 report used as the source of special access line counts, the values for this parameter should be set to 100% DS-0 and 0% DS-1.

Default

Percentage of Dedicated Circuits	
DS-0	DS-1
100%	0%

B40. Pairs per Dedicated Circuit

Definition

Factor expressing the number of wire pairs required per dedicated circuit classification.

Default

Pairs per Dedicated Circuit		
DS-0	DS-1	DS-3
1	2	56

WIRELESS INVESTMENT

B41. Wireless Investment Cap Enable

Definition

When enabled, invokes wireless investment cap for distribution plant investment calculations. In the default mode, the model does not impose the wireless cap.

Default

The default setting is disabled.

B42. Wireless Point to Point Investment Cap – Distribution

Definition

Per-subscriber investment for hypothetical point to point subscriber radio equipment.

Default

\$7,500

B43. Wireless Common Investment

Definition

Base Station Equipment investment for hypothetical broadcast wireless loop system.

Default

\$112,500

B44. Wireless Per Line Investment

Definition

Per-subscriber investment for hypothetical broadcast wireless loop systems, including customer premises equipment and per subscriber share of base station radios.

Default

\$500

B45. Maximum Broadcast Lines per Common Investment

Definition

Capacity of hypothetical base station common equipment, in lines.

Default

30

FEEDER INPUT PARAMETERS

COPPER PLACEMENT

B46. Copper Feeder Structure Fractions

Definition

The relative amounts of different structure types supporting sheath feet of copper feeder cable in each density zone. Aerial feeder cable is attached to telephone poles, buried cable is laid directly in the earth, and underground cable runs through underground conduit.

Default Values

Copper Feeder Structure Fractions			
Density Zone	Aerial/Bloc k Cable	Buried Cable	Undergroun d Cable (calculated)
0-5	.50	.45	.05
5-100	.50	.45	.05
100-200	.50	.45	.05
200-650	.40	.40	.20
650-850	.30	.30	.40
850-2,550	.20	.20	.60
2,550-5,000	.15	.10	.75
5,000-10,000	.10	.05	.85
10,000+	.05	.05	.90

**Note: Buried Fraction Available for Shift for Copper Feeder Structure Fractions is taken from the Buried Fraction Available for Shift for Fiber Feeder Structure Fractions.*

B47. Copper Feeder Manhole Spacing, feet

Definition

The distance, in feet, between manholes for copper feeder cable.

Default Values

Copper Feeder Manhole Spacing, feet	
Density Zone	Distance between manholes, ft.
0-5	800
5-100	800
100-200	800
200-650	800
650-850	600
850-2,550	600
2,550-5,000	600
5,000-10,000	400
10,000+	400

B48. Copper Feeder Pole Spacing, feet

Definition

Spacing between poles supporting aerial copper feeder cable.

Default Values

Copper Feeder Pole Spacing	
Density Zone	Spacing, ft.
0-5	250
5-100	250
100-200	200
200-650	200
650-850	175
850-2,550	175
2,550-5,000	150
5,000-10,000	150
10,000+	150

B49. Copper Feeder Pole Investment

Definition

The installed cost of a 40' Class 4 treated southern pine pole.

Default Value

Pole Investment	
Materials	\$201
Labor	\$216
Total	\$417

B50. Inner Duct Material Investment per foot

Definition

Material cost per foot of inner duct.

Default Value

\$0.30

FIBER PLACEMENT

B51. Fiber Feeder Structure Fractions

Definition

The relative amounts of different structure types supporting fiber feeder cable in each density zone. Aerial feeder cable is attached to telephone poles, buried cable is laid directly in the earth, and underground cable runs through underground conduit.

Default Values

Fiber Feeder Structure Fractions				
Density Zone	Aerial/Blo ck Cable	Buried Cable	Undergroun d Cable (calculated)	Fraction of Buried Available for Shift
0-5	.35	.60	.05	.75
5-100	.35	.60	.05	.75
100-200	.35	.60	.05	.75
200-650	.30	.60	.10	.75
650-850	.30	.30	.40	.75
850-2,550	.20	.20	.60	.75
2,550-5,000	.15	.10	.75	.75
5,000-10,000	.10	.05	.85	.75
10,000+	.05	.05	.90	.75

B52. Fiber Feeder Pullbox Spacing, feet

Definition

The distance, in feet, between pullboxes for underground fiber feeder cable.

Default Values

Fiber Feeder Pullbox Spacing, feet	
Density Zone	Distance between pullboxes, ft.
0-5	2,000
5-100	2,000
100-200	2,000
200-650	2,000
650-850	2,000
850-2,550	2,000
2,550-5,000	2,000
5,000-10,000	2,000
10,000+	2,000

B53. Buried Fiber Sheath Addition, per foot

Definition

The cost of dual sheathing for additional mechanical protection of buried fiber feeder cable.

Default Value

\$0.20/foot

SIZING FACTORS

B54. Copper Feeder Cable Sizing Factors

Definition

The factor by which copper feeder cable capacity is increased above the size needed to serve a given quantity of demand in order to provide spare pairs for breakage, line administration, and some amount of growth. Calculated as the ratio of the number of assigned pairs to the total number of available pairs in the cable.

Default Values

Copper Feeder Cable Sizing Factors	
Density Zone	Factors

0-5	.65
5-100	.75
100-200	.80
200-650	.80
650-850	.80
850-2,550	.80
2,550-5,000	.80
5,000-10,000	.80
10,000+	.80

B55. Fiber Feeder Cable Sizing Factor

Definition

Percentage of fiber strands in a cable that is available to be utilized.

Default

Fiber Feeder Cable Sizing Factor	
Density Zone	Factor
0-5	1.00
5-100	1.00
100-200	1.00
200-650	1.00
650-850	1.00
850-2,550	1.00
2,550-5,000	1.00
5,000-10,000	1.00
10,000+	1.00

CABLE COSTS

B56. Copper Feeder Cable; \$/ foot, per pair-foot

Definition

The cost per foot (\$/foot) and per pair-foot of copper feeder cable, as a function of cable size, including the costs of engineering, installation, and delivery, as well as the cable material itself. The copper investment per pair-foot is used in estimating comparative life-cycle costs for copper feeder.

Default Value

Copper Feeder Investment	
Cable Size	\$/foot (u/g & aerial)
4200	\$29.00
3600	\$26.00
3000	\$23.00
2400	\$20.00
1800	\$16.00
1200	\$12.00
900	\$10.00
600	\$7.75
400	\$6.00
200	\$4.25
100	\$2.50
Copper Investment per Pair – foot	
\$ 0.0075 / pair-ft	

B57. Fiber Feeder Cable; \$/foot, per strand-foot

Definition

The cost per foot (\$/foot) and per strand-foot of fiber feeder cable, as a function of cable size, including the costs of engineering, installation, and delivery, as well as the cable material itself. The fiber investment per strand-foot is used in estimating comparative life-cycle costs for copper and fiber feeder.

Default Value

Fiber Feeder Investment	
Cable Size	\$/foot (u/g & aerial)
216	\$13.10
144	\$9.50
96	\$7.10
72	\$5.90
60	\$5.30
48	\$4.70
36	\$4.10
24	\$3.50
18	\$3.20
12	\$2.90
Fiber Investment per Strand – foot	
\$ 0.10 / fiber-ft	

DIGITAL LOOP CARRIER EQUIPMENT

B58. DLC site and power per remote terminal

Definition

The investment associated with site and power for the remote terminal of a Digital Loop Carrier (DLC) system.

Default Value

Remote Terminal Site and Power	
High Density DLC	Low Density DLC
\$3,000	\$1,300

B59. Maximum Line Size per Remote Terminal

Definition

The maximum number of lines supported by the initial line module of a remote terminal.

Default

Maximum Line Increment per Remote Terminal	
High Density DLC	Low Density DLC
672	120

B60. Remote terminal sizing factor

Definition

The line unit sizing factor in a DLC remote terminal, that is, the ratio of lines served by a DLC remote terminal to the number of line units equipped in the remote terminal.

Default Value

Remote Terminal Sizing Factors	
High Density DLC	Low Density DLC
0.90	0.90

B61. DLC initial common equipment investment

Definition

The cost of all common equipment and housing in the remote terminal, as well as the fiber optics multiplexer required at the CO end for the initial line module of the DLC system (assumes integrated digital loop carrier (IDLC) with a GR-303 interface to the local digital switch).

Default Value

Remote Terminal Initial Common Equipment Investment	
High Density DLC	Low Density DLC
\$66,000	\$16,000

B62. DLC channel unit investment

Definition

The investment in channel units required in the remote terminal of the DLC system.

Default Value

DLC Type	DLC channel unit investment per unit	
	POTS Channel Unit	Coin Channel Unit
High Density	\$310	\$250
Low Density	\$600	\$600

B63. DLC Lines per CU

Definition

The number of lines that can be supported on a single DLC channel unit.

Default Value

DLC Type	DLC Lines per channel unit	
	POTS	Coin
High Density	4	2
Low Density	6	6

B64. Low Density DLC to High Density DLC Cutover

Definition

The threshold number of lines served, above which the High Density DLC will be utilized.

Default

480

B65. Fibers per remote terminal

Definition

The number of fibers connected to each DLC remote terminal.

Default Value

Fibers per Remote Terminal	
High Density DLC	Low density DLC
4	4

B66. Optical Patch Panel

Definition

The investment required for each optical patch panel associated with a DLC remote terminal.

Default

Optical Patch Panel	
High Density DLC	Low density DLC
\$1000	\$1000

B67. Copper Feeder Maximum Distance, feet

Definition

The feeder length above which fiber feeder cable is used in lieu of copper cable. The value must be less than 18,000 feet.

Default Value

9,000 feet

B68. Common Equipment Investment per Additional Line Increment

Definition

The cost of the common equipment required for each additional line module in a remote terminal.

Default

Common Equipment Investment per Additional Line Increment	
High Density	Low Density
672 Lines	120 Lines
\$18,500	\$9,400

B69. Maximum Number of Additional Line Modules per Remote Terminal

Definition

The number of line modules (in increments of 672 or 120 lines) that can be added to a remote terminal.

Default

Max. # Add. Line Modules/RT	
High Density DLC	Low density DLC
2	1

COPPER MANHOLE INVESTMENT

B70. Manhole Investment, materials and labor

Definition

The installed cost of a prefabricated concrete manhole, including backfill and restoration. All the non-italicized costs in the following table are separately adjustable.

Default Value

Copper Cable Manhole Investment						
Density Zone	Materials	Frame & Cover	Site Delivery	Total Material	Excavation & Backfill	Total Installed Manhole
0-5	\$1,865	\$350	\$125	<i>\$2,340</i>	\$2,800	<i>\$5,140</i>
5-100	\$1,865	\$350	\$125	<i>\$2,340</i>	\$2,800	<i>\$5,140</i>
100-200	\$1,865	\$350	\$125	<i>\$2,340</i>	\$2,800	<i>\$5,140</i>
200-650	\$1,865	\$350	\$125	<i>\$2,340</i>	\$2,800	<i>\$5,140</i>
650-850	\$1,865	\$350	\$125	<i>\$2,340</i>	\$3,200	<i>\$5,540</i>
850-2,550	\$1,865	\$350	\$125	<i>\$2,340</i>	\$3,500	<i>\$5,840</i>
2,550-5,000	\$1,865	\$350	\$125	<i>\$2,340</i>	\$3,500	<i>\$5,840</i>
5,000-10,000	\$1,865	\$350	\$125	<i>\$2,340</i>	\$5,000	<i>\$7,340</i>
10,000+	\$1,865	\$350	\$125	<i>\$2,340</i>	\$5,000	<i>\$7,340</i>

B71. Dewatering factor for manhole placement

Definition

Fractional increase in manhole placement to reflect additional cost required to install manholes in presence of shallow water table.

Default

0.20

B72. Water table depth for dewatering

Definition

Water table depth at which dewatering factor is invoked.

Default

5.00 feet

FIBER PULLBOX INVESTMENT

B73. Fiber Feeder Pullbox Investment

Definition

The investment per fiber pullbox in the feeder portion of the network.

Default Values

Fiber Pullbox Investment		
Density Zone	Pullbox Materials	Pullbox Installation
0-5	\$280	\$220
5-100	\$280	\$220
100-200	\$280	\$220
200-650	\$280	\$220
650-850	\$280	\$220
850-2,550	\$280	\$220
2,550-5,000	\$280	\$220
5,000-10,000	\$280	\$220
10,000+	\$280	\$220

SWITCHING AND INTEROFFICE TRANSMISSION PARAMETERS

END OFFICE SWITCHING

B74. Switch real-time limit, busy hour call attempts

Definition

The maximum number of busy hour call attempts (BHCA) a switch can handle. If the model determines that the load on a processor, calculated as the number of busy hour call attempts times the processor feature load multiplier, would exceed the switch real time limit multiplied by the switch maximum processor occupancy, it will add a switch to the wire center.

Default Values

Switch Real-time limit, BHCA	
Lines Served	BHCA
1-1,000	10,000
1,000-10,000	50,000
10,000-40,000	200,000
40,000+	600,000

B75. Switch traffic limit, BHCCS

Definition

The maximum amount of traffic, measured in hundreds of call seconds (CCS), the switch can carry in the busy hour (BH). If the model determines that the offered traffic load on an end office switching network exceeds the traffic limit, it will add a switch.

Default Value

Lines	Busy Hour CCS
1-1,000	30,000
1,000-10,000	150,000
10,000-40,000	600,000
40,000+	1,800,000

B76. Switch maximum equipped line size

Definition

The maximum number of lines plus trunk ports that a typical digital switching machine can support.

Default Value

80,000

B77. Switch port administrative fill

Definition

The percent of lines in a switch that are assigned to subscribers compared to the total equipped lines in a switch.

Default Value

0.98

B78. Switch maximum processor occupancy

Definition

The fraction of total capacity (measured in busy hour call attempts, BHCA) an end office switch is allowed to carry before the model adds another switch.

Default Value

0.90

B79. MDF/Protector Investment per Line

Definition

The Main Distribution Frame investment, including protector, required to terminate one line.

Default Value

\$12.00

B80. Analog Line Circuit Offset for DLC lines, per line

Definition

The reduction in per line switch investment resulting from the fact that line cards are not required in both the switch and remote terminal for DLC-served lines.

Default Value

\$5.00

B81. Switch installation multiplier

Definition

Definition: The telephone company investment in switch engineering and installation activities, expressed as a multiplier of the switch investment.

Default Value

1.10

B82. End Office Switching Investment Constant Term

Definition

The value of the constant ("B") appearing in the function that calculates the per line switching investment as a function of switch line size for an amalgam of host-remote and stand alone switches, expressed separately for BOCs and large independents (ICOs), on the one hand, and for small ICOs, on the other hand. The function is cost per line = $A \ln X + B$, where X is the number of lines.

Default Values

BOC and Large ICO	Small ICO
\$242.73	\$416.11

B83. End Office Switching Investment Slope Term

Definition

The constant multiplying the log function appearing in the EO switching investment function ("A" in the function shown in parameter 4.1.9.) that calculates the per line switching investment as a function of switch line size for an amalgam of host-remote and stand alone switches. This term is the same for BOCs, large independents, and small independents.

Default Value

-14.922

B84. Processor feature loading multiplier

Definition

The amount by which the load on a processor exceeds the load associated with ordinary telephone calls, due to the presence of vertical features, Centrex, etc., expressed as a multiplier of nominal load.

Default Value

The default value is 1.20 for business line percentage up to the variable business penetration rate, increasing linearly above that rate to a final value of 2.00 for 100% business lines.

B85. Business Penetration Ratio

Definition

The percentage of business lines to total line at which the processor feature loading multiplier is assumed to reach the "heavy business" value of 2.

Default Value

0.30

WIRE CENTER

B86. Lot size, multiplier of switch room size

Definition

The multiplier of switch room size to arrive at total lot size to accommodate building and parking requirements.

Default Value

2

B87. Tandem/EO wire center common factor

Definition

The percentage of tandem switches that are also end office switches or are collocated in wire centers with end office switches. This accounts for the fact that tandems and end offices are often located together, and is employed to avoid double counting of land and other wire center investment in these instances.

Default Value

0.4

B88. Power investment

Definition

The wire center investment required for rectifiers, battery strings, back-up generators and various distributing frames, as a function of switch line size.

Default Value

Lines	Investment Required
0	\$5,000
1000	\$10,000
5000	\$20,000
25,000	\$50,000
50,000	\$250,000

B89. Switch room size

Definition

The area in square feet required to house a switch and its related equipment.

Default Value

Switch Room Size	
Lines	Sq. Feet of Floor Space Required
0	500
1,000	1,000
5,000	2,000
25,000	5,000
50,000	10,000

B90. Construction costs, per sq. ft.

Definition

The costs of construction of a wire center building.

Default Value

Construction Costs per sq. ft.	
Lines	Cost/sq. ft.
0	\$75
1,000	\$85
5,000	\$100
25,000	\$125
50,000	\$150

B91. Land price, per sq. ft.

Definition

The land price associated with a wire center.

Default Value

Lines	Price/sq. ft.
0	\$5.00
1,000	\$7.50
5,000	\$10.00
25,000	\$15.00
50,000	\$20.00

TRAFFIC PARAMETERS

B92. Local Call Attempts

Definition

The number of yearly local call attempts, as reported to the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B93. Call Completion Fraction

Definition

The percentage of call attempts that result in a completed call. Calls that result in a busy signal, no answer, or network blockage are all considered incomplete.

Default Value

0.7

B94. IntraLATA Calls Completed

Definition

The number of yearly intraLATA call attempts, as reported by the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B95. InterLATA Intrastate Calls Completed

Definition

The number of yearly interLATA intrastate call attempts, as reported to the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B96. InterLATA Interstate Calls Completed

Definition

The number of yearly interLATA interstate call attempts, as reported to the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B97. Local DEMs, thousands

Definition

The number of yearly local DEMs, as reported to the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B98. Intrastate DEMs, thousands

Definition

The number of yearly intrastate DEMs, as reported to the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B99. Interstate DEMs, thousands

Definition

The number of yearly interstate DEMs, as reported to the FCC.

Default Value

Taken from ARMIS reports for the LEC being studied.

B100. Local bus/res DEMs ratio

Definition

The ratio of local Business DEMs per line to local Residential DEMs per line.

Default Value

1.1

B101. Intrastate bus/res DEMs

Definition

The ratio of intrastate Business DEMs per line to intrastate Residential DEMs per line.

Default Value

2

B102. Interstate bus/res DEMs

Definition

The ratio of interstate Business DEMs per line to interstate Residential DEMs per line.

Default Value

3

B103. Busy hour fraction of daily usage

Definition

The percentage of daily usage that occurs during the busy hour.

Default Value

0.10

B104. Annual to daily usage reduction factor

Definition

The effective number of business days in a year, used to concentrate annual usage into a fewer number of days as a step in determining busy hour usage.

Default Value

270

B105. Holding time multipliers, residential/business

Definition

The potential modification to the average call "holding time" (i.e., duration) to reflect Internet use or other causes, expressed as a multiplier of the holding time associated with ordinary residential or business telephone calls.

Default Value

Holding time multipliers	
Residential	Business
1.0	1.0

B106. Call attempts, Busy Hour (BHCA), residential/business

Definition

The number of call attempts originated per residential and business subscriber during the busy hour.

Default Value

Busy Hour Call Attempts	
Residential	Business
1.3	3.5

INTEROFFICE INVESTMENT

B107. Transmission Terminal Investment

Definition

The investment in 1) the fully-equipped add-drop multiplexer (ADM) that extracts/inserts signals into OC-48 or OC-3 fiber rings, and are needed in each wire center to connect the wire center to the interoffice fiber ring; and 2) the fully-equipped OC-3/DS-1 terminal multiplexers required to interface to the OC-48 ADM and to provide point to point circuits between on-ring wire centers and end offices not connected directly to a fiber ring. The "Investment per 7 DS-1" figure is the amount by which the investment in OC-3s is reduced for each unit of 7 DS-1s below full capacity of the OC-3.

Default Value

Transmission Terminal Investment			
OC-48 ADM, Installed		OC-3/DS-1 ADM/Terminal Multiplexer, Installed	Investment per 7 DS-1s
48 DS-3s	12 DS-3s	84 DS-1s	7 DS-1s
\$50,000	\$40,000	\$26,000	\$500

B108. Number of fibers

Definition

The assumed fiber cross-section, or number of fibers in a cable, in an interoffice fiber ring and point to point connection.

Default Value

24

B109. Pigtail Investment

Definition

The cost of the short fiber connectors that attach the interoffice ring fibers to the wire center transmission equipment via a patch panel.

Default Value

\$60.00 per pigtail

B110. Optical Distribution Panel

Definition

The cost of the physical fiber patch panel used to connect 24 fibers to the transmission equipment.

Default Value

\$1,000.00

B111. EF&I, per hour

Definition

The per-hour cost for the “engineered, furnished, and installed” activities for equipment in each wire center associated with the interoffice fiber ring, such as the “pigtailed” and patch panels to which the transmission equipment is connected.

Default Value

\$55.00

B112. EF&I, units

Definition

The number of hours required to install the equipment associated with the interoffice transmission system (see EF&I, per hour, above).

Default Value

32 hours

B113. Regenerator investment, installed

Definition

The installed cost of an OC-48 optical regenerator.

Default Value

\$15,000

B114. Regenerator spacing, miles

Definition

The distance between digital signal regenerators in the interoffice fiber optics transmission system.

Default Value

40 miles

B115. Channel Bank Investment, per 24 lines

Definition

The investment in voice grade to DS-1 multiplexers in wire centers required for some special access circuits.

Default Value

\$5,000

B116. Fraction of SA Lines Requiring Multiplexing

Definition

The percentage of special access circuits that require DS-0 to DS-1 multiplexing in the wire center in order to be carried on the interoffice transmission system. This parameter is for use in conjunction with a study of the cost of special access circuits.

Default Value

0.0

B117. Digital Cross Connect System, Installed, per DS-3

Definition

The investment required for a digital cross connect system that interfaces DS-1 signals between switches and OC-3 multiplexers, expressed on a per DS-3 basis (672 DS-0).

Default Value

\$30,000

B118. Transmission Terminal Fill (DS-0 level)

Definition

The fraction of maximum DS-0 circuit capacity that can actually be utilized in ADMs, DS-1 to OC-3 multiplexers, and channel banks.

Default Value

0.90

B119. Interoffice Fiber Cable investment per foot, installed

Definition

The installed cost per foot of interoffice fiber cable, assuming a 24-fiber cable.

Default Value

\$3.50 installed and buried

B120. Number of Strands per ADM

Definition

The number of interoffice fiber strands connected to the ADM in each wire center. At least four strands per ADM are required around the ring.

Default Value

4

B121. Interoffice Structure Percentages

Definition

The relative amounts of different structure types supporting interoffice transmission facilities. Aerial cable is attached to telephone poles or buildings, buried cable is laid directly in the earth, and underground cable runs through underground conduit. Aerial and buried percentages are entered by the user; the underground fraction is then computed.

Default Values

Structure Percentages		
Aerial	Buried	Underground
20%	60%	20%

B122. Transport Placement

Definition

The cost of placement of fiber cable used in the interoffice transmission system.

Default Values

Transport Placement, per foot	
Buried	Conduit
\$1.77	\$16.40

B123. Buried Sheath Addition

Definition

The cost of dual sheathing for additional mechanical protection of fiber interoffice transport cable.

Default Value

\$0.20/foot

B124. Interoffice conduit, cost and number of tubes

Definition

The cost per foot for interoffice fiber cable conduit, and the number of spare tubes (conduit) placed per

route.

Default Values

Cost per foot	Spare tubes per route
\$0.60	1

B125. Pullbox Spacing

Definition

Spacing between pullboxes in the interoffice portion of the network.

Default Value

2,000 feet

B126. Pullbox Investment

Definition

Investment per fiber pullbox in the interoffice portion of the network.

Default Value

\$500

B127. Pole Spacing, Interoffice

Definition

Spacing between poles supporting aerial interoffice fiber cable.

Default Value

150 feet

B128. Interoffice pole material and labor

Definition

The installed cost of a 40' Class 4 treated southern pine pole.

Default Value

Pole Investment	
Materials	\$201
Labor	<u>\$216</u>
Total	<u>\$417</u>

B129. Fraction Interoffice Structure Common With Feeder

Definition

The percentage of structure supporting interoffice transport facilities that is also shared by feeder facilities, expressed as a fraction of the smaller of the interoffice and feeder investment for each of the three types of facilities (i.e., aerial, buried and underground are considered separately in calculating the amount of sharing).

Default

0.75

B130. Fraction of interoffice structure assigned to telephone

Definition

The fraction of investment in interoffice poles and trenching that is assigned to LECs. The remainder is attributed to other utilities/carriers

Default Value

Fraction of Interoffice Structure Assigned to Telephone		
Aerial	Buried	Underground
0.33	0.33	0.33

TRANSMISSION PARAMETERS

B131. Operator traffic fraction

Definition

Fraction of traffic that requires operator assistance. This assistance can be automated or manual (see Operator Intervention Fraction in the Operator Systems section below)

Default

0.02

B132. Total interoffice traffic fraction

Definition

The fraction of all calls that are completed on a switch other than the originating switch, as opposed to calls completed within a single switch.

Default

0.65

B133. Maximum trunk occupancy, CCS

Definition

The maximum utilization of a trunk during the busy hour.

Default

27.5

B134. Trunk port investment, per end

Definition

Per-trunk equivalent investment in switch trunk port at each end of a trunk.

Default

\$100

B135. Direct-routed fraction of local inter-office

Definition

The amount of local interoffice traffic that is directly routed between originating and terminating end offices as opposed to being routed via a tandem switch.

Default

0.98

B136. Tandem routed fraction of total intraLATA traffic

Definition

Fraction of intraLATA calls that are routed through a tandem.

Default

0.2

B137. Tandem routed fraction of total interLATA traffic

Definition

Fraction of interLATA (IXC access) calls that are routed through a tandem instead of directly to the IXC.

Default

0.2

B138. POPs per Tandem Location

Definition

The number of IXC points of presence requiring an entrance facility, per LEC tandem.

Default

5

B139. Threshold value for off-ring wire centers

Definition

The threshold value, in lines, that determines whether a wire center should be included in ring calculations and therefore be a candidate to appear on (that is, be directly connected to) a ring. Wire centers whose size falls below the threshold will not appear on a ring, but will be connected via a point-point link to the tandem switch or via a "spur" to the nearest wire center that is on a ring. Transmission equipment in such cases consists of terminal multiplexers and not ADMs. This parameter only applies to companies that own and operate a local tandem switch.

Default

1 line

B140. Remote - host fraction of interoffice traffic

Definition

Fraction of local direct traffic assumed to flow from a remote to its host switch.

Default

0.10

B141. Host - remote fraction of interoffice traffic

Definition

Fraction of local direct traffic assumed to flow from a host to its remotes.

Default

0.05

B142. Maximum nodes per ring

Definition

Maximum number of ADMs that are permitted on a single ring.

Default

16

B142a. Ring transiting traffic factor

Definition

An estimated factor, representing the fraction of traffic that flows from one ring to another by way of a third, or "transit," ring.

Default

0.40

B142b. Intertandem fraction of tandem trunks

Definition

A factor used to estimate the number of additional trunks required to carry intertandem traffic.

Default

0.10

TANDEM SWITCHING

B143. Real time limit, BHCA

Definition

The maximum number of BHCA a tandem switch can process.

Default

750,000

B144. Port limit, trunks

Definition

The maximum number of trunks that can be terminated on a tandem switch.

Default

100,000

B145. Tandem common equipment investment

Definition

The amount of investment in tandem switch common equipment, which is the hardware and software that is present in the tandem in addition to the trunk terminations themselves. The cost of a tandem is estimated by the HM as the cost of common equipment plus an investment per trunk terminated on the tandem.

Default

\$1,000,000

B146. Maximum trunk fill (port occupancy)

Definition

The fraction of the maximum number of trunk ports on a tandem switch that can be utilized.

Default

0.90

B147. Maximum real time tandem occupancy

Definition

The fraction of the total capacity (expresses as the real time limit, BHCA) a tandem switch is allowed to carry before an additional switch is provided.

Default

0.90

B148. Tandem common equipment intercept factor

Definition

The multiplier of the common equipment investment input that gives the common equipment cost for the smallest tandem switch, allowing scaling of tandem switching investment according to trunk requirements.

Default

0.50

B149. Entrance Facility Distance from Serving Wire Center & IXC POP

Definition

Average length of trunks connecting an IXC with the wire center that serves it.

Default

0.5 miles

SIGNALING

B150. STP link capacity

Definition

The maximum number of signaling links that can be terminated on a given STP pair.

Default Value

720

B151. STP maximum fill

Definition

The fraction of maximum links, as stated by the STP link capacity input, that the model assumes can be utilized before it adds another STP pair.

Default Value

0.80

B152. STP maximum common equipment investment, per pair

Definition

The cost to purchase and install an STP pair, fully equipped for the maximum number of links.

Default Value

Maximum investment: \$5,000,000

B153. STP minimum common equipment investment, per pair

Definition

The minimum investment for a minimum-capacity STP, i.e.: the fixed investment for an STP pair that serves a minimum number of links.

Default Value

\$1,000,000

B154. Link termination, both ends

Definition

The investment required for the transmission equipment that terminates both ends of an SS7 signaling link.

Default Value

\$900.00

B155. Signaling link bit rate

Definition

The rate at which bits are transmitted over an SS7 signaling link.

Default Value

56,000 bits per second

B156. Link occupancy

Definition

The fraction of the maximum bit rate that can be sustained on an SS7 signaling link.

Default Value

0.40

B157. C link cross-section

Definition

The number of C-links in each segment connecting a mated STP pair.

Default Value

24

B158. ISUP messages per interoffice BHCA

Definition

The number of Integrated Services Digital Network User Part (ISUP) messages associated with each interoffice telephone call attempt, i.e. the messages switches send to each other over the SS7 network to negotiate establishing a voice path.

Default Value

6

B159. ISUP message length, bytes

Definition

The average number of bytes in each ISUP (ISDN User Part) message.

Default Value

25 bytes

B160. TCAP messages per transaction

Definition

The number of Transaction Capabilities Application Part (TCAP) messages required per SCP database query. A TCAP message is a message from a switch to a database or another switch that provides the switch with additional information prior to setting up a call or completing a call.

Default Value

2

B161. TCAP message length, bytes

Definition

The average length of a TCAP message.

Default Value

100 bytes

B162. Fraction of BHCA requiring TCAP

Definition

The percentage of BHCAs that require a database query, and thus generate TCAP messages.

Default Value

0.10

B163. SCP investment per transaction per second

Definition

The investment in the Service Control Point (SCP) associated with database queries, or transactions, stated as the investment required per transaction per second. For example, an SCP required to handle 100 transactions per second would require a 2 million dollar investment, if the default of \$20,000 is assumed.

Default Value

\$20,000

OS AND PUBLIC TELEPHONE

B164. Investment per operator position

Definition

The investment per computer required for each operator position.

Default Value

\$6,400

B165. Maximum utilization per position, CCS

Definition

The estimated maximum number of CCS that one operator position can handle during the busy hour.

Default Value

32

B166. Operator intervention factor

Definition

The percentage of all operator-assisted calls that require operator intervention, expressed as 1 out of every N calls, where N is the value of the input.

Default Value

10

B167. Public Telephone equipment investment per station

Definition

The weighted average cost of a public telephone and pedestal (coin/non-coin and indoor/outdoor).

Default Value

\$760

ICO PARAMETERS

B168. ICO STP Investment per Line

Definition

The surrogate value for the per line investment in a signal transfer point by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$5.50

B169. Per Line ICO Local Tandem Investment

Definition

The surrogate value for the per line investment in a local tandem switch by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$1.90

B170. Per Line ICO OS Tandem Investment

Definition

The surrogate value for the per line investment in an Operator Services tandem switch by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$0.80

B171. Per Line ICO SCP Investment

Definition

The surrogate value for the per line investment in a SCP by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$2.50

B172. Per Line ICO STP/SCP Wire Center Investment

Definition

The surrogate value for the per line investment in an STP/SCP wire center by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$0.40

B173. Per Line ICO Local Tandem Wire Center Investment

Definition

The surrogate value for the per line investment in a local tandem wire center by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$2.50

B174. Per Line ICO OS Tandem Wire Center Investment

Definition

The surrogate value for the per line investment in a operator services tandem wire center by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$1.00

B175. Per Line ICO C-Link / Tandem A-Link Investment

Definition

The surrogate value for the per line investment in a C-link / tandem A-link by an independent telephone company (ICO), in lieu of calculating it directly in the model.

Default Value

\$0.30

B175a. Equivalent Facility Investment per DS0

Definition

The per-DS0 surrogate facilities investment by a small ICO for dedicated circuits between an end office and tandem switch belonging to the BOC (or other large LEC) on which the ICO relies for interoffice connectivity.

Default Value

\$138.08

B175b. Equivalent Terminal Investment per DS0

Definition

The per-DS0 surrogate investment by a small ICO for terminal equipment used on dedicated circuits between an end office and tandem switch belonging to the BOC (or other large LEC) on which the ICO relies for interoffice connectivity.

Default Value

\$111.62

HOST / REMOTE ASSIGNMENT

B176. Host / remote CLLI assignments

Definition

An input form consisting of parameters that allow the user to specify the set of host and remote wire centers, and establish the relationships between remotes and their serving host, using the CLLI codes of the respective switches. In the default mode, HM 5.0a assumes all switches operate independently, and thus does not include host/remote designations or relationships.

Default Value

Default settings do not define hosts or remotes.

B177. Host / remote assignment enable

Definition

An option that, if enabled, instructs the model to perform switching calculations based on the host-remote relationships defined by Parameter 4.10.1.

Default Value

Default setting is disabled.

HOST / REMOTE INVESTMENT

B177a. Line Size Designation

Definition

The line size designation of fixed and per line investments for standalone, host, and remote switches.

Default Value

Line Size
0
640
5,000
10,000

B177b. Fixed and per Line Investments

Definition

The fixed and per line investments included in the function that calculates the per line switching investment as a function of switch line size for host, remote, and stand alone switches, expressed separately for BOCs and large independents and for small independents. The cost function for each type of switch and each type of telephone company is assumed to have the form $A + B * x$, where A is the fixed investment, B is the per-line investment, and x is the number of lines.

Default Value

Fixed and per Line Investments for Standalone, Host and Remote Switches						
BOCs and Large ICOs						
Line Size	Standalone fixed investment	Host fixed investment	Remote fixed investment	Standalone per line investment	Host per line investment	Remote per line investment
0	\$175,000	\$183,750	\$10,000	\$75	\$75	\$85
640	\$175,000	\$183,750	\$55,000	\$75	\$75	\$83
5,000	\$175,000	\$183,750	\$70,000	\$75	\$75	\$85
10,000	\$475,000	\$498,750	\$225,000	\$73	\$73	\$70
Small ICOs						
Line Size	Standalone fixed investment	Host fixed investment	Remote fixed investment	Standalone per line investment	Host per line investment	Remote per line investment
0	\$300,001	\$315,001	\$17,143	\$129	\$129	\$146
640	\$300,001	\$315,001	\$94,286	\$129	\$129	\$141
5,000	\$300,001	\$315,001	\$120,000	\$129	\$129	\$146
10,000	\$814,289	\$855,003	\$385,716	\$124	\$124	\$120

EXPENSE

COST OF CAPITAL

B178. Cost of capital

Definition

The capital cost structure, including the debt/equity ratio, cost of debt, and return on equity, that makes up the overall cost of capital.

Default Values

Debt percent	0.450
Cost of debt	0.077
Cost of equity	0.119
Weighted average cost of capital	<i>0.1001</i>

DEPRECIATION AND NET SALVAGE

B179. Depreciation Lives and Net Salvage Percentages

Definition

The economic life and net salvage value of various network plant categories.